

WHAT IS CLAIMED IS

1. A thixocast Fe-based alloy material comprising

1.8 % by weight $\leq C \leq 2.5$ % by weight,

1.0 % by weight $\leq Si \leq 3.0$ % by weight,

5 0.1 % by weight $\leq Mn \leq 1.5$ % by weight,

0.5 % by weight $\leq Ni \leq 3.0$ % by weight, and

as the balance, iron (Fe) including inevitable
impurities,

wherein a eutectic crystal amount E_c is in a range of 10 %
10 by weight $< E_c < 50$ % by weight.

2. A thixocast Fe-based alloy material comprising

1.8 % by weight $\leq C \leq 2.5$ % by weight

1.0 % by weight $\leq Si \leq 3.0$ % by weight

0.8 % by weight $\leq Mn \leq 1.5$ % by weight, and

15 as the balance, iron (Fe) including inevitable
impurities,

wherein a eutectic crystal amount E_c is in a range 10 %
by weight $< E_c < 50$ % by weight.

3. A thixocast Fe-based alloy material, comprising carbon (C)
20 of a content in a range of 1.8 % by weight $\leq C \leq 2.5$ % by weight,
silicon (Si) of a content in a range of 1.0 % by weight $\leq Si$
 ≤ 3.0 % by weight, manganese (Mn) of a content in a range of
0.6 % by weight $\leq Mn \leq 1.5$ % by weight, at least one of nickel
(Ni) of a content in a range of 0.2 % by weight $\leq Ni \leq 3.0$ %

by weight and titanium (Ti) of a content in a range of 0.05 %
 by weight $\leq \text{Ti} \leq 0.6$ % by weight, the total sum of the Mn content,
 the Ni content and the Ti content being equal to or larger than
 0.8 % by weight ($\text{Mn} + \text{Ni} + \text{Ti} \geq 0.8$ % by weight), and the balance
 5 being iron (Fe) including inevitable impurities, wherein a
 eutectic crystal amount is in a range of 10 % by weight $< \text{Ec}$
 < 50 % by weight.

4. A thixocast Fe-based alloy material according to claim 1,
 2 or 3, wherein a solid phase rate R in a semi-molten state is
 10 set at $R > 50$ %.

5. A process for heating a thixocast Fe-based alloy material
 having a chilled structure into a semi-molten state in which
 solid and liquid phases coexist,

the process comprising setting an average rate H_R of heating
 15 to a point A_1 in an Fe-C based equilibrium diagram to be in a
 range of $0.5^\circ\text{C}/\text{sec} \leq H_R \leq 6.0^\circ\text{C}/\text{sec}$, and setting a maximum
 temperature gradient T_G of the inside of the Fe-based alloy
 material per unit distance to be at $T_G \leq 7^\circ\text{C}/\text{mm}$.

6. A process for heating a thixocast Fe-based alloy material
 20 according to claim 5, further setting a sonic velocity S_v of
 said Fe-based alloy material determined by an ultrasonic velocity
 measurement to be at $S_v \geq 5,600$ m/sec.